Notes on the Spawning and Egg Capsules of Two Prosobranch Gastropods: *Nassarius tiarula* (Kiener, 1841) and *Solenosteira macrospira* (Berry, 1957)

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(2 Text figures)

Both *Nassarius tiarula* (Kiener, 1841) and *Solenosteira macrospira* (Berry, 1957) occur intertidally on mudflats throughout the Gulf of California. According to Keen (1971), *S. macrospira* is endemic to the Gulf, but *N. tiarula* ranges as far south as Panamá. Collections and observations for this study were made at Cholla Bay, 11 km north of Puerto Peñasco in the northern Gulf of California.

Spawning can be observed from April through the last part of June for *Nassarius tiarula*. Females deposit pale yellow egg capsules in clusters of 15 to 30 on empty shells lying just beneath the surface of the mud. The capsules are vase-shaped and have 4 sides. The front and back are flat with slightly convex sides (Figure 1a). Each has an opening at the top fitted with a mucous plug. The bottom of the capsule tapers to a long, narrow stalk, which is attached to an adhesive disk. The entire capsule measures 13 mm high and about 3 mm wide. Each capsule contains about 50 eggs which float in an albuminous fluid.

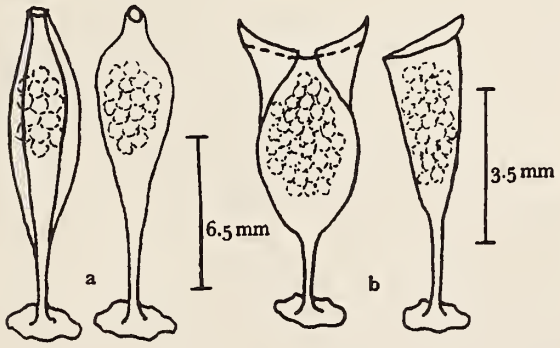

Figure 1

Egg capsules: a - *Nassarius tiarula*; b - *Solenosteira macrospira*

During dissection of gravid females, egg capsules were released from the genital opening. First a small transparent bubble appeared which proved to be the basal region of the capsule. As the bubble was squeezed out, the opening was distended to about 3 times its normal diameter. Shortly after, the eggs were released and appeared initially as a single string surrounded by albuminous fluid. Prior to release of the capsule, the eggs clumped into a central mass. The top of the capsule with the mucous plug intact was the last to leave the nidamental opening. This newly formed capsule was soft and transparent. It was then transported along a ciliated groove to the foot.

Histological sections reveal the 5 layers that compose the capsule wall (Figure 2a). An innermost mucous layer (mu) is surrounded by a coat of circular fibers (ci). Peripheral to this is a loose network of fibers interspersed by lacunae (mpl), which are filled with a mucoid substance. The 4th layer is another stratum of circular fibers. The final layer is a tenuous mucous coat surrounding the entire capsule.

Solenosteira macrospira begins spawning in March and continues through the first week of June. This is an interesting species because the female deposits the capsules on the shell of a living male buried beneath the mud. On many occasions the shell of the male was completely covered by the capsules. Gemmell (1973) first reported this behavior in populations of *S. macrospira* near San Felipe, Baja California.

The capsules are transparent and the reddish-brown eggs can be observed inside floating in the albuminous fluid. The flask-shaped capsules stand about 7 mm high and are attached to the shell by a long, slender stalk similar to that of *Nassarius tiarula* (Figure 1b). In each

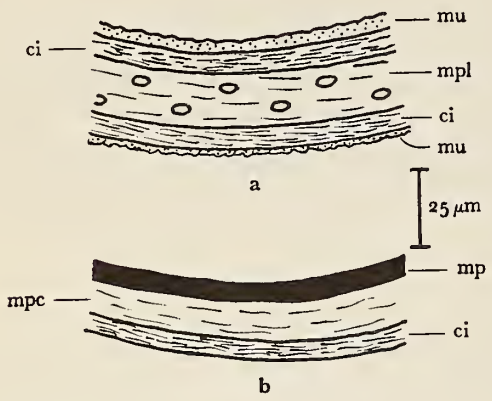

Figure 2

Egg Capsule Histology

a - *Nassarius tiarula* b - *Solenosteira macrospira*
ci – circular protein fibers mp – muco-protein
mpl – muco-protein fibers interspersed by lacunae
mpc – muco-protein fibers mu – mucus

capsule there are up to 500 eggs averaging 200 μm in diameter.

The wall of the egg capsule consists of 3 layers (Figure 2b). The inner region is a muco-protein layer (mp), not a mucous one as in *Nassarius tiarula*. The middle layer is a thick, fibrous muco-protein coat (mpc). This is covered by an outer layer consisting of circular fibers (ci). Similar conditions were observed by FRETTER (1941) for egg capsules of *Nucella lapillus* (Linnaeus, 1758). ANKEL (1937) suggested that the egg capsules of *N. lapillus* are composed of 2 substances, the protein and conchiolin intermixed with mucus or a mucoid substance. This has been substantiated in histochemical studies by BAYNE (1968), in which acid mucopolysaccharides and conchiolin were found to be the major components of the capsule wall.

The long slender stalks allow the egg capsules to extend above the mud where the developing embryos are exposed to ample water circulation. Since competition for hard substrates is severe, females of *Solenosteira macrospira* have overcome this problem by depositing egg capsules on the shells of their mates.

ACKNOWLEDGMENT

I am grateful to Dr. Carl Kadner for reviewing the manuscript.

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